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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/391,250	09/07/1999	KAZUYOSHI TORII	520.37546X00	8298

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EXAMINER

NGUYEN, CUONG QUANG

ART UNIT PAPER NUMBER

2811

DATE MAILED: 12/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/391,250

Applicant(s)

TORII ET AL.

Examiner

Cuong Q Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4, 7-11, 14-18 and 29-33 is/are pending in the application.
- 4a) Of the above claim(s) 14-18 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-11, 30-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. Newly amended claims 14-18 and 29 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: newly amended claims 14-18 and 29 directed to non-elected embodiment of Fig.15 to Fig.21 which is a different patentably from original claims drawn to embodiment of Fig.1 to Fig.14.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 14-18 and 29 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 7-11, and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hartner et al. (WO 9815013 A1) in view of Okudaira et al. (US 5,418,388).

Hartner et al. discloses a semiconductor device comprising: a substrate (10); a transistor formed on the substrate; an interlayer insulating film (2) having an opening formed on the substrate and the transistor; a conductive film (1, a plug) formed in the opening contacting to the transistor; a capacitor including a first electrode (5), a ferroelectric film (6) on an upper surface of the first electrode and in contact to side surfaces of the first electrode, and a second electrode (16) on the ferroelectric film; an insulating layer (4, a SiN layer) formed between the interlayer insulating film and the ferroelectric film and between the lower surface of first electrode and insulating film a diffusion barrier layer (3, a TiN layer) formed in the opening between the conductive film and the first electrode and directly contact with a lower surface of the first electrode, wherein the ferroelectric film is not in contact with the barrier diffusion film; wherein an upper surface of diffusion barrier film and an upper surface of the insulating layer are substantially on a same plane. See Hartner et al.'s Fig.1.

Hartner et al. does not explicitly teach which material is used to form the ferroelectric layer and the insulating layer is formed of TiO<sub>2</sub> and thicknesses of diffusion barrier and reaction barrier film are substantially the same.

It is noted that in the back ground of the invention, Hartner et al. teach that materials such that PZT and SBT are art recognized material for forming the ferroelectric layer.

Okudaira et al. discloses a semiconductor device comprising: an insulating layer (11) of SiN or TiO<sub>2</sub> formed between an interlayer insulating film (10) and a ferroelectric film of PZT or SBT, and between a lower surface of a first electrode (14) and insulating film.

It is known in the art that the thicknesses of diffusion barrier and reaction barrier film would have been determinable by one of ordinary skill in the art through no more

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than routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

It would have been obvious to one of ordinary skill in the art to form the ferroelectric layer of conventional materials such that PZT and BST as taught in the background of the invention in Hartner et al. and as taught by Okudaira et al. It also would have been obvious to form the insulating layer between the interlayer insulating film and the ferroelectric film of TiO<sub>2</sub> instead of SiN as taught by Hartner et al. because as taught by Okudaira et al., SiN and TiO<sub>2</sub> are common materials for forming the insulating layer between the interlayer insulating film and ferroelectric film and they are interchangeable.

It would have been obvious to one of ordinary skill in the art to provide the thicknesses of diffusion barrier and reaction barrier film being substantially the same as claimed by routine experimentation.

It is noted that the insulating layer between the interlayer insulating film and a ferroelectric film in the device being by the combination of Hartner et al. and Okudaira et al. is formed of TiO<sub>2</sub> which is identical material in the reaction barrier in the present invention. Therefore, the TiO<sub>2</sub> insulating layer in the device being by the combination of Hartner et al. and Okudaira et al. can function as (or means for) a reactive barrier layer which can prevent a reaction between the insulating film and the ferroelectric.

### ***Response to Arguments***

3. Applicant's arguments with respect to claims 1-4, 7-11 and 30-33 have been considered but are not persuasive.

Applicants argue that applied arts do not teach the thicknesses of diffusion barrier and reaction barrier film are substantially the same. In response, as above discussion, one of ordinary skill in the art to provide the thicknesses of diffusion barrier and reaction

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barrier film being substantially the same as claimed by routine experimentation. Moreover, Applicants do not provide any evidence that the thicknesses of diffusion barrier and reaction barrier film have to be substantially the same in order to obtain an unexpected result or these thicknesses are critical in the present invention.

***Conclusion***

4. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 872-9306. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

5. Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to CUONG Q NGUYEN whose telephone number is (703) 308-1293. The Examiner is in the Office generally between the hours of 6:30 AM to 5:00 PM (Eastern Standard Time) Monday through Thursday.

**If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Eddie Lee who can be reached on (703) 308-1690.**

Any inquiry of a general nature or relating to the status of this application should be directed to the Technology Center Receptionists whose telephone number is 308-0956.



Cuong Nguyen

Primary examiner

12/11/03